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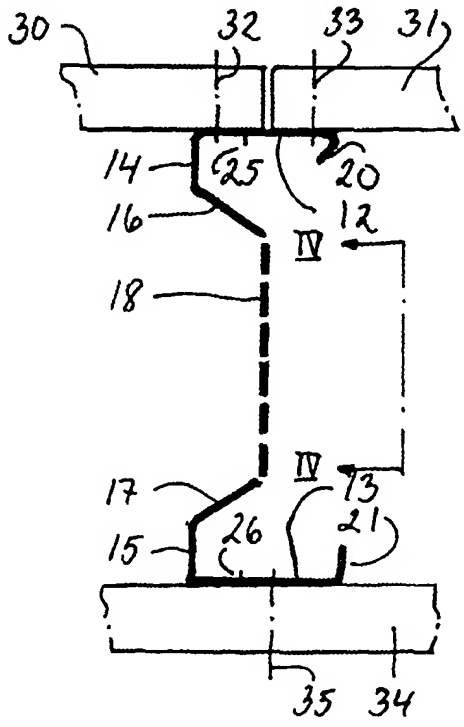
(54) Title: A SOUND-INSULATING PARTITION WALL



(57) Abstract: A sound-insulating partition wall comprises vertical studs (2) at a distance of about 40-60 cm from each other, at least one wallboard (3), preferably a gypsum wallboard, attached at each side of the stud, and optionally mineral wool wholly or partly filling the cavity between the studs. Each stud of bent sheet steel has two parallel flanges (12, 13) and an intermediate web (14-18), being retracted at at least half the length between the flanges (12, 13) a distance that is between 1/3 and 2/3 of the width of the flanges.

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A SOUND-INSULATING PARTITION WALL

Technical Field

The present invention relates to a sound-insulating partition wall or interior wall in a building.

Background of the Invention

Partition walls are often composed of a framework provided at both sides with wallboards, preferably gypsym boards. It is well known that such walls may give a poor and unsatisfactory sound-insulation between neighboring rooms. Many methods of improving the sound-insulation for such walls have been tried, but very often the result is either not satisfactory in terms of the sound-insulation obtained or too expensive in view of high cost for the involved materials and/or for the labour.

The Invention

A better result in terms of sound-insulation and cost is according to the invention attained by a partition wall, comprising vertical studs at a distance of about 40-60 cm from each other, at least one wallboard, preferably a gypsum wallboard, attached at each side of the stud, and optionally mineral wool wholly or partly filling the cavity between the studs, wherein each stud of bent sheet steel has two parallel flanges and an intermediate web (14-18), being retracted at at least half the length between the flanges (12, 13) a distance that is between 1/3 and 2/3 of the width of the flanges.

Other features of the wall of the invention appear from the other claims as well as the description below and the appended drawings.

The Drawings

The invention will be further described below reference being made to the accompanying drawings, in which

Fig 1 is a perspective and partly broken-away illustration of a conventional wall construction,

Fig 2 is a cross section through a wall stud for use in a wall construction according to the invention,

Fig 3 in a cross section shows two studs according to Fig 2 brought together,

Fig 4 shows a possible slot pattern in the web of the stud along the arrows IV-IV in Fig 2,

Fig 5 is an end view showing a number of studs according to Figs 2 and 3 packed for transport,

Fig 6 shows the movement pattern of a stud according to Fig 2 when exposed to a point load acting on a flange of the stud perpendicularly to a web thereof, and

Fig 7 shows an alternative to the wall stud shown in Fig 2.

Detailed Description of a Preferred Embodiment

A conventional partition wall or interior wall is shown in Fig 1. It consists of channels 1 of cold formed sheet steel for attachment to the floor and the ceiling in a building, substantially vertical studs 2, which also are made of cold formed sheet steel or the like and are attached between the channels 1, and at each side of the framework thus formed one or more wallboards 3 attached thereto, normally by screws. The wallboards 3 are often conventional gypsum boards. The cavity in the framework between the wallboards 3 can be wholly or partly filled with insulating material, such as mineral wool. In this case the studs 2 have a conventional C-profile.

The distance between consecutive studs 2 may normally be in the region of 400-600 mm. A conventional gypsum board may have a thickness of 10-18 mm.

A sheet steel stud shown in cross section in Fig 2 is a partition wall stud, which has two flanges 12, 13 and an intermediate web, consisting of two portions 14, 15 perpendicular to the flanges, two inclined portions 16, 17,

and a central portion 18. The central portion 18 of the web may have a great number of slots 19, as appears from Fig 4. As an alternative to the slots 19, holes or perforations may be provided in the central web portion 18.

The flanges 12, 13 have folded back edges 20, 21. The edge 21 of the flange 13 is folded perpendicularly to the flange, whereas the edge 20 of the flange 12 is folded back for example 135°, and the flange 12 is slightly shorter than the flange 13. Hereby, two studs may be put together or "boxed" for transport, as is shown in Fig 3. Such boxed studs can be piled into a transport package, as is shown in Fig 5. Boxed studs may also be used in partitions for increasing strength and stiffness and also for joining longer studs.

Fig 5 shows that the central web portion 18 roughly lies on a line between the center points of the flanges 12, 13, which is advantageous but not necessary. If the web portions 18 lie on the other side of the center line, these web portions will collide at attempts to put the profiles together according to Fig 3. If the web portions 18 do not extend to the center line of the profile, a distance between the web portions will occur when putting the profiles together according to Fig 3, which means that they will not be as compactly piled as is shown in Fig 5. Accordingly, the web portion 18 should be within a few mm, for example within 5 mm, from this line between the center points of the flanges but not pass it. It also appears from Fig 5 that the combined lengths of the web portions 14 and 15 shall not surpass the length of the web portion 18, if a full pileability shall be attained.

The stud shown and described herein has an improved handiness and strength, which makes it possible to utilize a thinner sheet steel material. These advantages start to appear at a certain retraction of the web. A reasonable lower limit is that the web 14-18 at at least 1/3 of the

distance between the flanges 12, 13 is retracted past a line, which joins the flange points 25, 26 at a third of the length the flanges as counted from the web portions 14, 15. A corresponding reasonable upper limit is 2/3.

Also shown in Fig 2 are two wallboards, for example gypsum wallboards 30, 31, which are joined on the flange 12 by means of schematically shown screws 32, 33, and a wallboard 34, which is attached to the flange 13 by schematically shown screws 35.

The web portion 18 may have rows of displaced or overlapping slots 19, which are shown in Figs 2 and 4.

Fig 6 illustrates the pliability of a stud according to the invention. The illustrated pliability assists in effectively reduce sound transfer; in other words, sound vibrations generated in boards attached to the stud are not transferred to boards on the other side of the stud to the same extent as with a C-stud.

In spite of its pliability the stud is seen as stiff at mounting, as the flanges do not have a tendency to rotate at pressure from a self drilling screw. Even when the web has a high degree of slots or perforations and accordingly very pliable, the flanges will rather tend to move in a parallel movement than in a rotating movement when the screws are fixed, and such a parallel movement does not have any negative effect on the mounting work. Even when a stud has a slotted web, the plate thickness can be decreased to 0.5 mm or less without any risk for the stud becoming too pliable at mounting.

The stud 2 used for a partition wall may typically have a profile height or web length of 70-150 mm and a flange width of 30-60 mm. It appears that a stud as shown and described has an increased stiffness and strength in comparison with a traditional stud with a so called C-profile having the same weight per length unit, in spite of the fact that the used material is thinner than usual. The

stiffness increase may be in the order of 18% and the strength increase in the order of 31% in terms of bending moment.

Fig 7 shows an alternative stud with the flanges oppositely directed. The pileability of studs as shown in Fig 7 is quite as good as for studs of Fig 2. Also in other respects the advantages for this alternative stud are the same as those for the stud of Fig 2.

Normally, an increased pliability and weakness of a stud can lead to an improved sound insulating capability of a wall construction, in which the stud is used. It is therefore a surprising effect of the stud as shown and described that its sound insulating capability in a wall construction is increased.

Comparative laboratory measurements on partition walls as defined above were made according to ISO 140-3 and evaluated according to EN-ISO 717-1, resulting in so called R_W-values for the walls, indicative for their sound-insulating capabilities. A higher value (in dB) means a better sound-insulating.

All wall measurements were made with two standard gypsum boards, each with a thickness of 12.5 mm, on each side of a framework containing studs. Measurements were in all instances first made on a certain wall with a stud as shown and described and then with a conventional stud with so called C-profile.

A first measurement series was made with studs having a profile height of 70 mm and a second one with a profile height of 95 mm, in the latter case in certain instances with studs having perforated or slotted central web portions. Measurements were made without and with mineral wool insulation of different thicknesses (ranging from 30 mm to 95 mm). The R_W-values with studs as shown and described herein ranged from 48 to 58 dB and with conventional studs from 42 to 54 dB. For comparable stud

pairs the improvement in sound insulation ranged from 2 to 6 dB, with a mean value of 4.3 dB. A small additional improvement in this respect was attained with perforated or slotted web portions. A thicker mineral wool insulation improves the sound-insulation both for studs as shown and described herein and conventional studs with C-profiles.

CLAIMS

1. A sound-insulating partition wall, comprising vertical studs (2) at a distance of about 40-60 cm from each other, at least one wallboard (3), preferably a gypsum wallboard, attached at each side of the stud, and optionally mineral wool wholly or partly filling the cavity between the studs, wherein each stud of bent sheet steel has two parallel flanges (12, 13) and an intermediate web (14-18), being retracted at at least half the length between the flanges (12, 13) a distance that is between 1/3 and 2/3 of the width of the flanges.

2. A wall according to claim 1, wherein the flanges (12, 13) extend in the same direction.

3. A wall according to claim 1, wherein the flanges are oppositely directed.

4. A wall according to claim 1, wherein the profile height or total web length of the stud (2) is 70-150 mm and its flange width 30-60 mm.

5. A wall according to claim 1, wherein the central web portion (18) is perpendicular to the flanges (12, 13) and imaginary prolongation lines from said web portion cross the flanges within a few mm from its respective center points.

6. A wall according to claim 5, wherein the web portions (14, 15) at the flanges (12, 13) have a combined length which is less than the length of the central web portion (18).

7. A wall according to any of the preceding claims, wherein the sheet steel thickness of the stud is maximum 0.5 mm.

8. A wall according to any of the preceding claims, wherein the stud in a central web portion (18) is provided with slots (19), holes or perforations.

9. A stud for use in a wall according to any of the preceding claims.

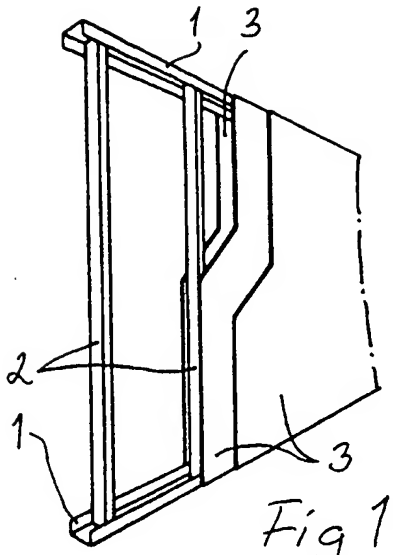

Fig 1

Fig 4

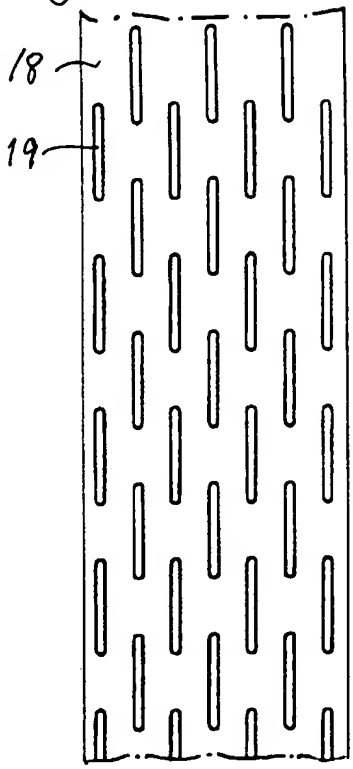

Fig 2

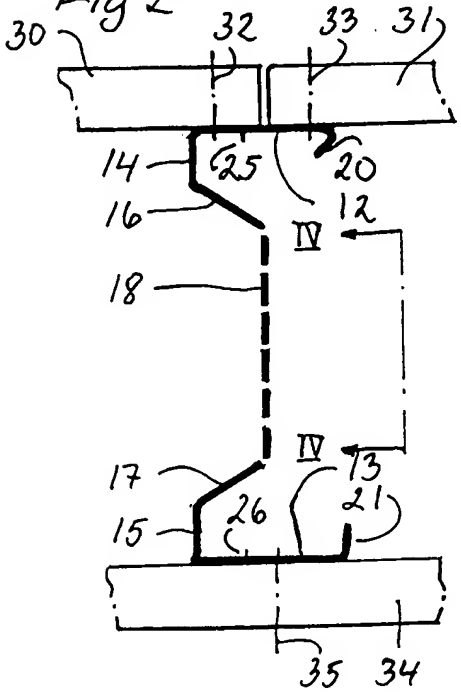

Fig 7

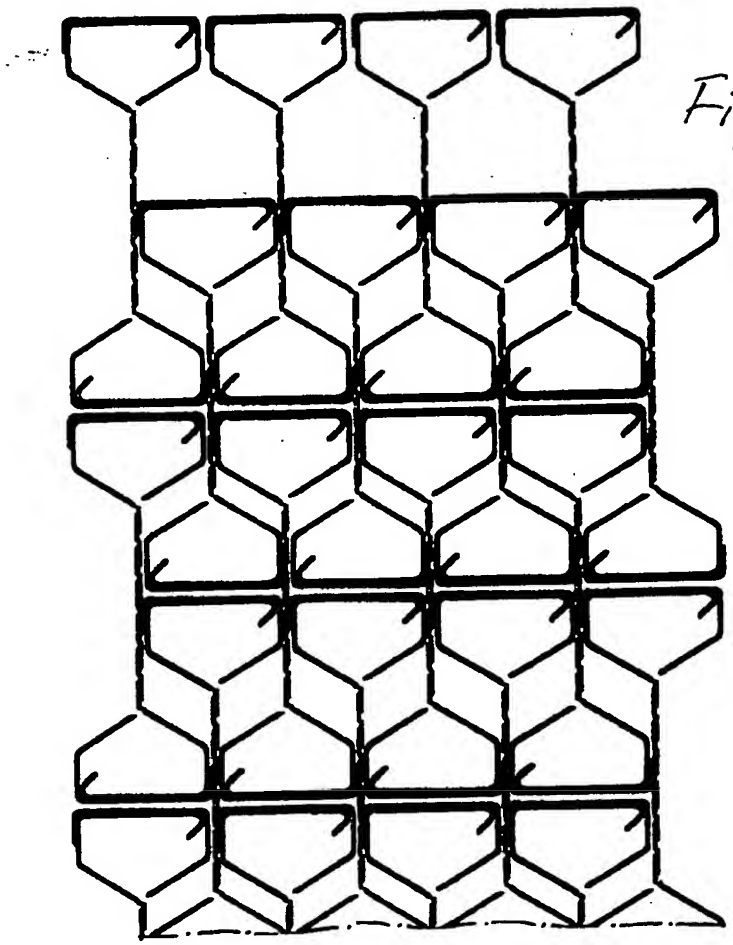

Fig 5

Fig 3

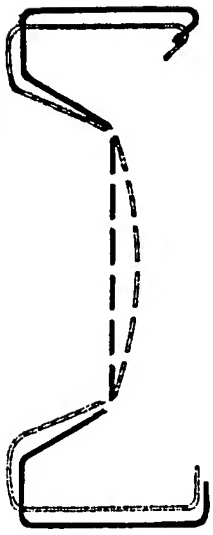

Fig 6

INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

IPC7: E04B 2/60, E04C 3/07
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: E04B, E04C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0374316 A1 (BODNAR, ERNEST R.), 27 June 1990 (27.06.90), column 6, line 13 - line 19; column 6, line 32 - column 7, line 22, figures 1-4	1,2,4-9
Y		3
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X	EP 0110373 A1 (WARD BROTHERS (SHERBURN) LIMITED), 13 June 1984 (13.06.84), page 3, line 21 - page 4, line 9; page 7, line 11 - line 23, figures 1-3, abstract	1,2,4-9
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Y	EP 0469909 A1 (WARD BUILDING SYSTEMS LIMITED), 5 February 1992 (05.02.92), column 6, line 24 - line 25, figures 1 e	3
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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
15 March 2001	06 -04- 2001
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Ingemar Hedlund/MP Telephone No. +46 8 782 25 00

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International application No.
PCT/SE 00/02699

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	FR 2766904 A1 (PLACOPLATRE SOCIETE ANONYME), 5 February 1999 (05.02.99), page 5, line 12 - page 7, line 4, figures 1,2 --- --------	1-9

INTERNATIONAL SEARCH REPORT

Information on patent family members

25/02/01

International application No.
PCT/SE 00/02699

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